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Crystal-Structure Modulation in the Anomalous Low-Temperature Phase of $PrFe_4P_{12}$

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A filled-skutterudite compound, $PrFe_4P_{12}$, exhibits heavy-electron-like behaviors.* It undergoes a transition to a mysterious phase below 6.5 K at zero magnetic field. Although the magnetic susceptibility shows a cusp at the transition temperature, neutron powder diffraction did not detect any magnetic order.† In order to clarify the nature of the phase transition, we performed X-ray diffraction experiments at low temperatures under magnetic field. In the low-temperature phase, satellite peaks were observed at the reciprocal-lattice points corresponding to the wave vector $\mathbf{q}$ = (1 0 0) for the structure in the high-temperature phase ($Im\bar{3}$). Therefore, the order parameter of the phase transition can be the atomic displacement corresponding to the structural modulation. The present X-ray study is consistent with the band-structure study on $LaFe_4P_{12}$ which predicts a nesting of the Fermi surface with the same wave vector as we observed.‡

*H. Sato *et al.*: Phys. Rev. B **62** (2000) 15125.
†L. Keller *et al.*: to be published in J. Alloys and Compounds.
‡H. Sugawara *et al.*: J. Phys. Soc. Jpn. **69** (2000) 2938.